

DATA PROCESSING DEVICE, FACSIMILE MACHINE HAVING DATA
PROCESSING FUNCTION, DATA MANAGING DEVICE
ASSOCIATED WITH THE DATA PROCESSING
DEVICE AND COMPUTER PROGRAM

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BACKGROUND OF THE INVENTION

The present invention relates to a data processing de-
vice for handling image data, a facsimile machine having data
processing function, a data managing device for managing image
10 data to be handled by the data processing device, and a com-
puter program employed by the data processing device, the data
managing device and the facsimile machine.

Conventionally, have been known a facsimile machine and
a personal computer installing therein an application software
15 for performing facsimile data transmission and reception, as a
data processing device. Image data is obtained through a com-
munication unit such as a modem from an external network such
as a public telephone line network and an internet, and the
obtained image data is processed with the data processing de-
20 vice.

Further, known is an image data reception processing
method, in which received image data is successively stored in
a work region prepared in a memory (RAM), and the image data
which have been stored in the memory are subjected to a prede-
25 termined processing (such as printing processing) when the im-
age data reception is regularly or normally completed.

In case of a facsimile machine with a reduced memory ca-

capacity, if facsimile data whose volume exceeds the reduced memory capacity is transmitted from an external facsimile machine to the facsimile machine with the reduced memory capacity, data reception cannot be normally completed. In order to avoid this drawback, according to an invention described in Japanese Patent Application Publication No.Hei-4-8055, a received data stored in the memory is temporarily transferred to a hard disc or other memory unit of an external host device connected to the facsimile machine with an interface, if a remaining memory capacity becomes not more than a predetermined amount.

The above-described technique has been proposed in an attempt to normalize the reception of the facsimile data in case of the facsimile machine having the reduced memory capacity. If such data transferring technique is employed, the facsimile data can be inspected at the external host device as described in Japanese Patent Application Publication No.2001-282694.

However, in the conventional device, in order to allow the external host device to be able to inspect the facsimile data, an appropriate application software for enabling inspection of the facsimile data must be installed in the external host device, and the facsimile machine must also install an application software compatible with the appropriate application software.

Such application software requires complicated bi-directional protocol so that the structure of the software is complicated, and require greater time and labor for development. Moreover, a prolonged time period is required for communication between the external host device and the facsimile machine.

SUMMARY OF THE INVENTION

It is a primary object of the present invention to provide a data processing device, a facsimile machine, and a program capable of transmitting to a terminal device only a selected image data among image data received through a network by a communication device, the selected image data being needed by a user of the terminal device, even if the terminal device does not install an appropriate application software.

Another object of the present invention is to manufacture the data processing device and the facsimile machine at low cost by making use of resources in the data processing device while attaining the primary object described above.

Still another object of the present invention is to provide a data managing device and a program used therein, capable of managing image data to be handled in the data processing device.

These and other objects of the present invention will be attained by a data processing device that is connected to and in communication with a terminal device including a memory

unit, a recognition setting unit, a communication unit, a data acquiring unit, a converting unit, and a writing unit. The memory unit includes an image data storage area that stores therein image data. The recognition setting unit enables the terminal device to recognize the image data storage area in the memory unit as an external storage device so as to enable the terminal device to be accessible to the image data storage area. The communication unit is connected to the terminal device through an external network. The data acquiring unit acquires image data received by way of the communication unit from the external network. The converting unit converts the acquired image data acquired by the data acquiring unit through the communication unit into converted image data whose format is compatible with the terminal device. The writing unit writes the converted image data converted by the converting unit into the image data storage area.

In another aspect of the invention, there is provided a facsimile machine including a scanner unit that reads an image of an original document, the communication unit, the memory unit, the recognition setting unit, the data acquiring unit, the converting unit, and the writing unit.

In still another aspect of the invention, there is provided a data managing device for use in combination with the data processing device. The data managing device includes a nonvolatile storage medium that stores image data, a determi-

nation unit, a duplicating unit, and a deletion unit. The determination unit makes judgment as to whether or not the image data has been stored in the external storage device in the data processing device. The duplicating unit writes the image data stored in the external storage device into the nonvolatile storage medium if the determination unit judges that the image data has been stored in the external storage device. The deletion unit deletes the image data having been stored in the external storage device from the external storage device after writing the image data into the nonvolatile storage medium by the duplicating unit.

In still another aspect of the invention, there is provided a storage medium that stores a program for permitting a facsimile machine to function as a data processing device, the facsimile machine including a communication unit connected to a terminal device through an external network, and a memory unit comprising an image data storage area that stores therein image data. The program at least contains first through fourth programs. The first program enables the terminal device to recognize the image data storage area in the memory unit as an external storage device so as to enable the terminal device to be accessible to the image data storage area. The second program acquires image data received by way of the communication unit from the external network. The third program converts the acquired image data through the communication unit into con-

verted image data whose format is compatible with the terminal device. The fourth program writes the converted image data converted by the converting unit into the image data storage area.

5 In still another aspect of the invention, there is provided a storage medium that stores a program for permitting a personal computer to function as a data managing device for use in combination with the data processing device, the personal computer including a nonvolatile storage medium that
10 stores image data. The program contains first through third programs. The first program makes a judgment as to whether or not the image data has been stored in the external storage device in the data processing device. The second program duplicates the image data stored in the external storage device
15 into the nonvolatile storage medium if the image data has been stored in the external storage device. The third program deletes the image data having been stored in the external storage device from the external storage device after duplicating the image data into the nonvolatile storage medium.

20 BRIEF DESCRIPTION OF THE DRAWINGS

In the drawings:

Fig. 1 is a block diagram showing structures of a digital multifunction device and a personal computer to which the present invention is applied;

25 Fig. 2 is an explanatory diagram showing a structure of

a RAM 12;

Fig. 3 is a flowchart showing steps in a switching process executed by a CPU in the digital multifunction device;

5 Fig. 4 is a flowchart showing steps in a recognition setting process executed by the CPU;

Fig. 5 is a flowchart showing steps in a fax receiving process executed by the CPU;

Fig. 6 is a flowchart showing steps in a first image forming process executed by the CPU;

10 Fig. 7 is a flowchart showing steps in a converting/writing process executed by the CPU;

Fig. 8 is an explanatory diagram showing a structure of a log file;

15 Fig. 9 is a flowchart showing steps in a mode selecting process executed by the CPU;

Fig. 10 is a flowchart showing steps in a second image forming process executed by the CPU;

Fig. 11 is a flowchart showing steps in a first fax transmitting process executed by the CPU;

20 Fig. 12 is a flowchart showing steps in a second fax transmitting process executed by the CPU;

Fig. 13 is a flowchart showing steps in a mail transmitting process executed by the CPU;

25 Fig. 14 is a flowchart showing steps in a data reading process executed by a CPU in a personal computer as a terminal

device connected to the digital multifunction device; and

Fig. 15 is a flowchart showing steps in a terminal-end fax transmitting process executed by the CPU of the personal computer.

5 DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENT

Next, a preferred embodiment of the present invention will be described with reference to the drawings. Fig. 1 shows the constructions of a digital multifunction device (MFC) 1 serving as the facsimile machine to which the present invention is applied and a personal computer (PC) 50 serving as the terminal device.

The digital multifunction device 1 includes a CPU 10 for performing comprehensive control of the device, and memory (a ROM 11 and a RAM 12) for storing programs, data, and the like required for operations by the CPU 10. The CPU 10 controls various components of the device, such as a scanning unit 21, a printing unit 23, and a line-controlling unit 25, via a bus 13 in order to implement a facsimile function, a printer function, a copier function, and the like.

The scanning unit 21 scans image content from an original document for fax transmissions (that is, the transmission of facsimile data), copying, and the like. The scanning unit 21 acquires an original document on which an image of text, graphics, or the like is formed from a paper supply tray (not shown) of the digital multifunction device 1. The scanning

unit 21 then optically scans the image from the original and generates image data as the scanning results.

The printing unit 23 functions as an image forming unit for forming (printing) color images or monochrome images on a recording paper. The printing unit 23 forms images based on image data on the recording paper when image data for printing is inputted from an external source.

The line-controlling unit 25 performs such processes as transmitting dial signals to a public telephone network and responding to call signals from the public telephone network. The line-controlling unit 25 is connected to the public telephone network, serving as the external network, via telephone lines installed in the building and transmits and receives facsimile data, voice communications, and the like between an external communication terminal (a facsimile machine 5, a telephone terminal, and the like) via this public telephone network.

Further, a modem 27 connected to the line-controlling unit 25 functions to convert facsimile data to communication signals to be transmitted via the public telephone network and extracts facsimile data by demodulating signals received from the public telephone network. In addition, a handset 26 is connected to the line-controlling unit 25 to enable voice communications in the digital multifunction device 1 with an external telephone terminal.

The digital multifunction device 1 also includes a liquid crystal display 28, an operation unit 29 including a plurality of operating keys, and the like. When various commands are inputted through user operations on the operation unit 29, the CPU 10 executes processes corresponding to the type of command.

For example, if a fax transmission command is inputted from the operation unit 29, the digital multifunction device 1 generates facsimile data by optically scanning an image from the original document using the scanning unit 21. Subsequently, the digital multifunction device 1 transmits the generated facsimile data to the external facsimile machine 5 connected to the public telephone network via the modem 27 and the line-controlling unit 25. Further, when facsimile data is received from the facsimile machine 5, the digital multifunction device 1 acquires the facsimile data via the line-controlling unit 25 and the modem 27 and controls the printing unit 23 to form an image based on the facsimile data (facsimile function).

When a copy command is inputted from the operation unit 29, the digital multifunction device 1 scans the image from the original using the scanning unit 21, inputs this image data into the printing unit 23, and controls the printing unit 23 to form an image on recording paper based on this image data (copier function).

The digital multifunction device 1 also includes a voice

input/output unit 31 for implementing a hands-free function. The voice input/output unit 31 includes a microphone 31a, a speaker 31b, and a drive circuit 31c for driving the microphone 31a and speaker 31b. The digital multifunction device 1
5 also includes a media drive 35 for reading various data from and writing various data to a memory card 33, such as a Compact Flash (registered trademark) card or the like.

The digital multifunction device 1 also includes a USB (universal serial bus) interface 37 and a LAN (local area network) interface 39. When image data is received from the external personal computer 50 via the USB interface 37 or from a personal computer connected to a LAN or the Internet via the LAN interface 39, the digital multifunction device 1 directs the printing unit 23 to form images based on this image data
10 on recording paper (printer function).

The digital multifunction device 1 has a virtual drive function that enables the personal computer 50 connected to the USB interface 37 to recognize an area of the RAM 12 (a virtual drive area 12d described later) as an external storage device and allows the personal computer 50 to access this area.
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The RAM 12 is configured primarily of a system area 12a, a work area 12b, a user area 12c, and a virtual drive area 12d. Fig. 2(a) is an explanatory diagram showing the structure in the RAM 12 when the virtual drive function is rendered ON. Fig.
25 2(b) is an explanatory diagram showing the structure in the

RAM 12 when the virtual drive function is rendered OFF.

The system area 12a is a memory space provided for executing programs for the primary management and operations of the digital multifunction device 1. The work area 12b is a memory space used for executing various functions possessed by the digital multifunction device 1. The user area 12c is a memory space for temporarily storing image data such as facsimile data acquired from an external source via the line-controlling unit 25, the USB interface 37, the LAN interface 39, and the like. The virtual drive area 12d is a memory space that the personal computer 50 can recognize as an external storage device.

The virtual drive area 12d is created only when the virtual drive function is on. The memory space corresponding to the virtual drive area 12d is used as the user area 12c while the virtual drive function is off. The virtual drive area 12d has a tree-like folder structure (called a directory), in which folders data files are sorted and stored.

Switching the virtual drive function (ON/OFF) is implemented in a switching process shown in Fig. 3 and a recognition setting process shown in Fig. 4. Fig. 3 is a flowchart showing the switching process executed by the CPU 10 when a switch command is inputted from the operation unit 29. In Fig. 3, a first mode implies an operation mode in which received facsimile data is not recorded but the facsimile data is

transferred to the PC, a second mode implies an operation mode in which the received facsimile data is recorded, and the facsimile data is transferred to the PC. A third mode is an operation mode in which the received facsimile data is recorded but the facsimile data is not transferred to PC. Fig. 4 is a flowchart showing the recognition setting process repeatedly executed by the CPU 10 at all times.

When a switch command is inputted from the operation unit 29, the CPU 10 determines which mode is indicated by the switch command, among the first mode through the third mode (S100). If the switch command is determined to be a command for switching to the first mode, then the CPU 10 sets the receiving/printing function for facsimile data to OFF (S111) and sets the virtual drive function to ON (S113). Here, the receiving/printing function for facsimile data is a function for quickly and automatically printing facsimile data received from an external source via the line-controlling unit 25, without prompting the user for printing confirmation.

When the process in S113 ends, the CPU 10 creates the virtual drive area 12d in the RAM 12 and creates a plurality of folders in the virtual drive area 12d for sorting and storing various data (S115). Specifically, the CPU 10 in the preferred embodiment creates a first folder for storing image data for printing, a second folder for storing image data for fax transmissions, a third folder for storing image data for

e-mail transmissions, and a fourth folder for storing facsimile data received via the line-controlling unit 25. After the plurality of folders has been created, the CPU 10 ends the process.

5 However, if the switch command is determined to be a command for switching to the second mode in S100, the CPU 10 sets the receiving/printing function for facsimile data to ON (S121) and sets the virtual drive function to ON (S123). In S125 the CPU 10 creates the virtual drive area 12d in the RAM
10 12 and creates the plurality of folders in the virtual drive area 12d. If the virtual drive area 12d has already been created, the process of S125 is skipped. Subsequently, the CPU 10 ends the switching process.

 Further, if the switch command is determined in S100 to
15 be a command for switching to the third mode, then the CPU 10 sets the receiving/printing function for facsimile data to ON (S131) and sets the virtual drive function to OFF (S133). Subsequently, the CPU 10 clears the virtual drive area 12d allocated in the RAM 12 and assigns this memory space to the user
20 area 12c (S135). Subsequently, the CPU 10 ends the switching process.

 Next, the recognition setting process (see Fig. 4) will be described. When the recognition setting process is executed, the CPU 10 waits until inquiry signals for confirming operations related to the USB device are transmitted from the per-
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sonal computer 50 (S210).

Specifically, Windows (registered trademark) and other operating systems are configured to transmit a "TEST UNIT READY" command from a USB interface 58 at intervals of several seconds as an inquiry signal for confirming operations related to the USB device. If the CPU 10 determines that the "TEST UNIT READY" command has been transmitted from the personal computer 50 via the USB interfaces 58 and 37 (S210: YES), the CPU 10 makes judgment as to whether or not the virtual drive function is on (S220).

If the CPU 10 determines that the virtual drive function is off (S220: NO), then the CPU 10 prevents the personal computer 50 from recognizing the virtual drive area 12d in the RAM 12 as an external storage device by transmitting a "NOT READY" command to the personal computer 50 via the USB interface 37 indicating that the virtual drive is not ready to operate (S230).

However, if the CPU 10 determines that the virtual drive function is on (S220: YES), then the CPU 10 enables the personal computer 50 to recognize the virtual drive area 12d as an external storage device by transmitting a "READY" command to the personal computer 50 via the USB interface 37 indicating that the virtual drive is ready for operations (S240). After completing this process, the CPU 10 ends the recognition setting process.

Next, a fax receiving process executed by the digital multifunction device 1 will be described. Fig. 5 is a flow-chart showing the fax receiving process that is repeatedly executed by the CPU 10.

5 At the beginning of the fax receiving process, the CPU 10 waits until a connection is established from the facsimile machine 5 to the line-controlling unit 25 via the public telephone network (S310). When a connection is established from the facsimile machine 5 to the line-controlling unit 25 (S310:
10 YES), then in S320 the CPU 10 determines whether the receiving/printing function is on.

 If the CPU 10 determines that the receiving/printing function is on (S320: YES), then the CPU 10 begins executing a first image forming process shown in Fig. 6 (S325) and ad-
15 vances to the process in S330. However, if the CPU 10 determines that the receiving/printing function is off (S320: NO), then the CPU 10 advances to S330 without executing the first image forming process.

 In S330, the CPU 10 determines whether the virtual drive
20 function is on. If the CPU 10 determines that the virtual drive function is on (S330: YES), then the CPU 10 begins executing a converting/writing process shown in Fig. 7 (S335) and subsequently advances to the process of S340. However, if the CPU 10 determines that the virtual drive function is off
25 (S330: NO), then the CPU 10 advances to S340 without executing

the converting/writing process.

In S340, the CPU 10 determines whether one page worth of facsimile data transmitted from the external facsimile machine 5 via the line-controlling unit 25 and the modem 27 has been acquired. If one page worth of data has not been acquired (S340: NO), then the CPU 10 acquires the facsimile data from the modem 27 and writes this data to the user area 12c (S350) until one page worth of facsimile data has been acquired (until a YES determination in S340).

When one page of worth of facsimile data has been written to the user area 12c, the CPU 10 determines YES in S340 and in S360 determines whether all pages of the facsimile data have been acquired (in other words, whether the facsimile machine 5 has completed transmission of the facsimile data).

If all pages of the facsimile data have not been acquired at this time (S360: NO), then the CPU 10 returns to S340, acquires the next page of facsimile data from the modem 27, and writes this data to the user area 12c. However, if the CPU 10 determines in S360 that all pages of facsimile data have been acquired (S360: YES), then the fax receiving process ends.

Next, the first image forming process initiated in S325 will be described. Fig. 6 is a flowchart showing the first image forming process that the CPU 10 executes in parallel with the fax receiving process.

When execution of the first image forming process is begun, the CPU 10 reads the facsimile data written to the user area 12c in the fax receiving process from the user area 12c (S410). The data may be read after one page worth of facsimile data has been written in the fax receiving process or after a plurality of pages worth of facsimile data has been written. The facsimile data may also be read without waiting for one page worth of facsimile data to be written.

After reading the facsimile data, the CPU 10 inputs the data into the printing unit 23 and controls the printing unit 23 to form (print) images based on this facsimile data on recording paper (S420). Subsequently, the CPU 10 determines whether all pages of the facsimile data have been printed (S430). If the CPU 10 determines that the printing is not complete (S430: NO), then the CPU 10 continues reading facsimile data from the user area 12c that was written in the fax receiving process (S410) and executes the above printing process (S420). After all pages of the facsimile data have been printed (S430: YES), the first image forming process ends.

Next, the converting/writing process initiated in S335 will be described. Fig. 7 is a flowchart showing the converting/writing process that the CPU 10 executes in parallel with the fax receiving process.

When execution of the converting/writing process is begun, the CPU 10 waits until one page worth of facsimile data

has been received and until this data has been written to the user area 12c (S510). After one page worth of facsimile data has been written to the user area 12c, the CPU 10 determines YES in S510 and reads this facsimile data from the user area 12c (S520).

Subsequently, the CPU 10 determines whether the facsimile data is color image data or monochrome image data (S530). If the CPU 10 determines that the facsimile data is color image data (S530: YES), then the CPU 10 converts the facsimile data to image data in the portable document format (PDF; S540).

Since facsimile data is generally encoded by the Modified Huffman (MH) method, in S540 the CPU 10 converts the image data in MH format to image data in PDF format, which is an image format that can be used by the personal computer 50 and in which data describing the arrangement of a plurality of pages can be embedded.

However, if the CPU 10 determines in S530 that the facsimile data is monochrome image data (S530: NO), then the CPU 10 converts the facsimile data to image data in tagged image file format (TIFF), which is an image format that can be used by the personal computer 50 and in which data describing the arrangement of a plurality of pages can be embedded (S545). Image data in the TIFF format stores data (tags) describing the arrangement of the plurality of pages and the image data for each page.

After the image data has been converted in this way, the CPU 10 writes the image data in the PDF format or the TIFF format that has been converted above to the user area 12c (S550). Subsequently, the CPU 10 determines whether all pages of the facsimile data have been converted to image data (S560). If the CPU 10 determines that not all pages have been converted (S560: NO), then the CPU 10 returns to S510, reads the next page of facsimile data from the user area 12c (S520), and converts this data to the PDF or TIFF format (S540 or S545). At this time, this next page of image data is combined with the previous page of image data to form a single image data (image data in the PDF or TIFF format). Next, the CPU 10 writes the converted image data to the user area 12c (S550).

When the CPU 10 determines that all pages of data have been converted (S560: YES), then the CPU 10 generates communication history data for the facsimile data just received. The CPU 10 updates the log file by writing this communication history data thereto (S570).

Fig. 8 is an explanatory diagram showing the structure of the log file. The log file stores data in the comma separated values (CSV) format, which is very versatile and compatible with the personal computer 50. This log file is stored in the work area 12b.

The CPU 10 generates communication history data based on results of receiving facsimile data from the line-controlling

unit 25 and modem 27 and appends this data in the log file. The communication history data includes data regarding the reception date, reception time, type of communication, transmission source, length of communication, number of received pages,
5 type of communication result, and filename of the received data. This log file is updated each time facsimile data is received. Therefore the log file stores communication history data for a plurality of communications.

Communication history data is written to the log file
10 not only when facsimile data is received, but also when facsimile data is transmitted. Communication history data for facsimile transmissions includes data related to the transmission date, transmission time, type of communication, transmission destination, length of communication, number of transmitted
15 pages, type of communication result, and filename of the transmitted data. Data related to the type of communication described above is used to differentiate communications of different types. For example, the characters "Rx" are attached to the communication history data for received faxes (when receiving facsimile data) as data representing the type of communication,
20 while the characters "Tx" are attached to the communication history data for transmitted faxes. The type of communication result is data representing whether the communication was performed normally. If the communication concluded
25 normally, the characters "OK" are added to the log file.

After updating the log file, in S580 the CPU 10 writes the converted image data to the fourth folder in the virtual drive area 12d. In S590 the CPU 10 writes the updated log file to the virtual drive area 12d, and subsequently ends the converting/writing process.

The operations of the digital multifunction device 1 were described above for a fax reception. When the personal computer 50 writes image data to the virtual drive area 12d while the virtual drive function is on, the digital multifunction device 1 reads this image data from the virtual drive area 12d and performs a prescribed process on the image data, such as a printing process, a fax transmitting process, or a mail transmitting process.

Next, the process executed by the CPU 10 when image data is written from the personal computer 50 into the virtual drive area 12d will be described. The CPU 10 selects one of a plurality of process modes according to the type of folder in which the image data has been written and executes a prescribed process corresponding to that mode on the image data. Fig. 9 is a flowchart showing a mode selecting process that the CPU 10 repeatedly executes at all times when the virtual drive function is on.

When executing the mode selecting process, the CPU 10 determines whether the personal computer 50 has written data to the virtual drive area 12d via the USB interface 37 (S610).

If the CPU 10 determines that data has been written, then the CPU 10 determines to which of the first through third folders provided in the virtual drive area 12d the data has been written (S620).

5 If the CPU 10 determines that data has been written to the first folder, then the CPU 10 advances to the process of S630 and executes a second image forming process shown in Fig. 10. After completing the second image forming process, the mode selecting process ends.

10 Fig. 10 is a flowchart showing the second image forming process executed by the CPU 10. When the second image forming process is executed, the CPU 10 reads image data stored in the first folder of the virtual drive area 12d (S631). Next, the CPU 10 converts this image data into print data with which the
15 printing unit 23 can form images (S632). The CPU 10 inputs this print data into the printing unit 23 and controls the printing unit 23 to form images on recording paper based on the print data (S633: printing process). After the printing is complete, the CPU 10 deletes the image data used for printing
20 from the virtual drive area 12d (S634) and ends the second image forming process.

 However, if the CPU 10 determines that data has been written to the second folder in S620, then the CPU 10 executes a first fax transmitting process shown in Fig. 11 (S640). Af-
25 ter completing the first fax transmitting process, the CPU 10

ends the mode selecting process.

Fig. 11 is a flowchart showing the first fax transmitting process executed by the CPU 10. When the first fax transmitting process is executed, the CPU 10 determines whether all data required for the fax transmission has been stored together in the second folder (S641). Data required for the fax transmission includes image data for transmission (facsimile data) and a transmission specification file storing destination data and transmission time data. If all required data is not present (S641: NO), then the CPU 10 immediately ends the first fax transmitting process.

However, if all necessary data is stored in the second folder (S641: YES), then the CPU 10 reads the image data and transmission specification file attached to the image data from the second folder (S642). Subsequently, the CPU 10 analyzes the transmission specification file and determines the transmission destination and the transmission time for the image data (facsimile data; S643). Here, the destination data stored in the transmission specification file is transmission destination data representing a telephone number or the like of the transmission destination. The transmission time data stored in the file is data representing the time of transmission (date, hour, minute, etc.).

Next, the CPU 10 enters the image data (facsimile data) together with the transmission destination data and the trans-

mission time data in a queue (S644). After entering the data in the queue, the CPU 10 deletes the image data for this entry and the transmission specification file corresponding to the image data from the virtual drive area 12d (S645) and ends the first fax transmitting process.

The facsimile data entered in the queue is transmitted to the facsimile machine 5 at the specified destination during a second fax transmitting process shown in Fig. 12. Fig. 12 is a flowchart showing the second fax transmitting process that the CPU 10 repeatedly executes at all times.

When the second fax transmitting process is executed, the CPU 10 determines whether facsimile data is entered in the queue (S651). If the CPU 10 determines that facsimile data has not been entered in the queue (S651: NO), then the CPU 10 waits until facsimile data has been entered in the queue.

However, when the CPU 10 determines that facsimile data is entered in the queue (S651: YES), then the CPU 10 determines whether the transmission time for the facsimile data has passed based on the transmission time data entered in the queue with the facsimile data (S652). If the CPU 10 determines that the transmission time has passed (S652: YES), then the CPU 10 transmits the facsimile data for which the transmission time has passed via the line-controlling unit 25 to the facsimile machine 5 at the destination specified in the first fax transmitting process based on the destination data (that is,

the destination corresponding to the transmission destination data; S653).

Subsequently, the CPU 10 deletes the facsimile data for transmission from the queue, generates the above-described communication history data based on the transmission results of the line-controlling unit 25, and updates the log file by writing this data thereto (S654). Next, the CPU 10 writes the log file to the virtual drive area 12d (S656) and ends the second fax transmitting process.

Further, if the CPU 10 determines that data has been written to the third folder in S620 of the mode selecting process, the CPU 10 executes a mail transmitting process shown in Fig. 13 (S660). After completing the mail transmitting process, the CPU 10 ends the mode selecting process. Fig. 13 is a flowchart showing the mail transmitting process executed by the CPU 10.

When execution of the mail transmitting process begins, the CPU 10 determines whether data required for transmitting e-mail has been stored in the third folder (S661). Data required for transmitting e-mail in the preferred embodiment includes image data attached to the e-mail and a transmission specification file including destination data and the like. If the CPU 10 determines that this required data is not present (S661: NO), the CPU 10 immediately ends the mail transmitting process.

However, if the CPU 10 determines that all required data is present in the third folder (S661: YES), then the CPU 10 reads the image data and the transmission specification file from the third folder (S662). Next, the CPU 10 analyzes the transmission specification file, determines the transmission destination of the e-mail (S663). The transmission specification file includes data representing an e-mail address or the like as the destination data indicating the transmission destination.

Subsequently, the CPU 10 converts the image data to data in an e-mail format (S664) and transmits this image data in the e-mail format to the destination represented by the destination data in the transmission specification file via the LAN interface 39 and a mail (SMTP) server 7 on the Internet (S665). Further, the CPU 10 deletes the image data used for the transmission and the transmission specification file corresponding to this image data from the virtual drive area 12d (S666) and ends the mail transmitting process.

While the construction of the digital multifunction device 1 according to the preferred embodiment has been described above, the construction and operations of the personal computer 50 connected to and in communication with the digital multifunction device 1 via the USB interface 37 will be described next.

The personal computer 50 is well known in the art and

includes a CPU 51, a ROM 52, a RAM 53, a hard disk 54, a display 55, a keyboard 56, a mouse 57, the USB interface 58, and a CD-ROM drive 59. The personal computer 50 is operated by an operating system such as Windows (registered trademark) having a Plug and Play function supporting USB.

A USB device (the digital multifunction device 1) connected to the USB interface 58 is detected and automatically recognized by the operating system of the personal computer 50. Specifically, the virtual drive area 12d of the digital multifunction device 1 is recognized by the Plug and Play function of the OS as an external storage device to the personal computer 50.

Programs for directing the CPU 51 to execute a data reading process and a terminal fax transmitting process described later can be optionally installed on the personal computer 50 by the user.

The program for the data reading process functions to manage various data stored in the virtual drive area 12d of the digital multifunction device 1. When this program is installed on the personal computer 50, the personal computer 50 functions as the data management device.

Fig. 14 is a flowchart showing the data reading process executed by the CPU 51 of the personal computer 50. The CPU 51 repeatedly executes this data reading process at all times.

When the data reading process is executed, the CPU 51

waits until a predetermined interval has elapsed (S710). After the predetermined interval has elapsed (S710: YES), in S720 the CPU 51 determines whether image data has been written to the fourth folder in the virtual drive area 12d. If the CPU 51
5 determines that image data has not been written to the fourth folder (S720: NO), then the CPU 51 returns to S710 and again waits for the predetermined interval to elapse.

However, if the CPU 51 determines that image data has been written to the fourth folder (S720: YES), then the CPU 51
10 advances to S730 and writes the data in the fourth folder on the hard disk 54 provided in the personal computer 50 as a nonvolatile storage medium. At this time, the image data is written to a prescribed folder on the hard disk 54 that has been preset by the user (S730). If the writing concludes nor-
15 mally, the CPU 51 deletes the data in the fourth folder from the virtual drive area 12d (S740). Subsequently, the data reading process ends.

By this data reading process, image data in the virtual drive area that will be lost when the power is turned off can
20 be transferred to a non-volatile storage medium. Accordingly, the user can easily see past image data (facsimile data) received by the digital multifunction device 1 at a later date on the display 55 of the personal computer 50.

A program for a terminal-end fax transmitting process is
25 designed for using the fax transmission function provided by

the digital multifunction device 1 on the personal computer 50 end. Fig. 15 is a flowchart showing the terminal-end fax transmitting process executed by the CPU 51 when the user operates an input device such as the keyboard 56 or the mouse 57 to input a fax transmission command into the CPU 51.

At the beginning of the terminal-end fax transmitting process, the CPU 51 displays a dialog box on the display 55 of the personal computer 50, prompting the user for the transmission destination of the facsimile data and subsequently acquires transmission destination data from the facsimile data upon manipulation of the input device (S810).

Next, the CPU 51 displays a dialog box on the display 55 prompting the user to input the transmission time for the facsimile data and subsequently acquires transmission time data for the facsimile data via the input device (S820).

Next, the CPU 51 displays a dialog box on the display 55 prompting the user to select a cover page to be attached as the first page and subsequently acquires selection data for a cover page via the input device (S830). The data for the cover page is stored on the hard disk 54 of the personal computer 50.

The CPU 51 further displays a dialog box on the display 55, prompting the user to specify image data to be transmitted as the facsimile data and subsequently acquires selection data (the filename for the image data or the like) for the image data to be transmitted via the input device (S840).

Next, the CPU 51 reads the image data to be transmitted, which image data is stored on the hard disk 54, according to the cover page selection data acquired in S830 and the transmission data selection data acquired in S840. Thus, the CPU 51
5 generates transmission data (facsimile data) in S850. That is, the CPU 51 converts this image data to the MH format and attaches image data of the cover page to the image data as the top page.

The CPU 51 creates a transmission specification file
10 (see Fig. 11) including the destination data and the transmission time data based on the transmission destination data and transmission time data acquired in S810 and S820 (S860).

Next, the CPU 51 writes the transmission data (facsimile data) generated above and the transmission specification file
15 to the second folder in the virtual drive area 12d (S870) and ends the terminal-end fax transmitting process. The digital multifunction device 1 processes the transmission data and transmission specification file by means of the first fax transmitting process of Fig. 11.

To this point, a description has been given for the
20 digital multifunction device 1 and the personal computer 50 of the preferred embodiment. According to the digital multifunction device 1 of the preferred embodiment, the CPU 10 enables the personal computer 50 to recognize the virtual drive area
25 12d in the RAM 12 as an external storage device in S240 of the

recognition setting process. Hence, the personal computer 50 can access image data stored in the virtual drive area 12d.

As a result, the user can acquire from the digital multifunction device 1 only a required data among various image data those stored in the virtual drive area 12d by operation of the personal computer 50, with the same sense as reading data from the hard disk 54 of the personal computer 50.

In other words, the user of the personal computer 50 can acquire from the digital multifunction device 1 only a required data among various image data those stored in the virtual drive area 12d by manipulating the keyboard 56 and the mouse 57 with the same sense as reading data from the hard disk 54 at a desired timing, for example, when the image data is to be needed. That is, the multifunction device 1 can selectively transmit to the personal computer 50 only the image data that the user of the personal computer 50 is needed among various image data received through the line controlling unit and the modem 27 through the network.

Generally, a widely available recent computer such as a personal computer is normally provided with Plug and Play function capable of automatically recognizing a device connected to the personal computer. The Plug and Play function can permit the personal computer 50 to recognize the virtual drive area 12d as the external storage device. By enabling the personal computer 50 to recognize the virtual drive area 12d

as an external storage device in the preferred embodiment based on the USB standard supporting Plug and Play, which is widely used in personal computers 50, the user need not install a special application software and driver or the like for enabling the personal computer 50 to recognize the virtual drive area 12d. The user can easily use the virtual drive function of the digital multifunction device 1.

That is, by the Plug and Play function if the personal computer 50 as the terminal device can automatically recognize a device in communication therewith, the personal computer 50 can recognize with the steps S115, S125, S135 the virtual drive area 12d as the external storage device through the function of the Plug and Play.

Further, in the digital multifunction device 1 according to the present embodiment, ON/OFF switching can be made in accordance with a user's demand with respect to the receiving/printing function (i.e., the first image forming process with reference to Fig. 6) and to the virtual drive function (i.e., converting/writing process with reference to Fig. 7) by executing the switching process with reference to Fig. 3 in the CPU10. Accordingly, image data can be processed by various ways in accordance with the using mode of the user.

In addition, in the digital multifunction device 1 according to the present embodiment, the RAM 12 defines therein the user area 12c and the virtual drive area 12d so as to

share the RAM 12, and the virtual drive area 12d can be functioned as an expanded user area in case where the virtual drive function is being off. Therefore, a memory resource in the device can be effectively utilized. In other words, a cost to the memory can be reduced, to thus produce the digital multifunction device 1 at a low cost. That is, it is unnecessary to provide the RAM 12 having a large storage capacity (such as a semiconductor memory), to thus lower the production cost.

Further, in the converting/writing process of the present embodiment, the facsimile data acquired through the modem 27 is converted into image data available for multiple pages (PDF) by way of the steps S540 and S545, and the image data of each page is put together to provide a data file. Therefore, the user can easily handle the image data already subjected to the conversion.

Since the facsimile data is constituted by image data for a plurality of pages, it is unnecessary to create data file through dividing the facsimile data into every page data if the facsimile data is converted into image data capable of handling multiple pages. Therefore, handling to the image data which has been subjected to data conversion can be simplified for the user of the personal computer 50. Image data of PDF (portable document format) and image data of TIFF (tagged image file format) are known as examples of the image data capable of handling multiple pages.

Moreover, in the present embodiment, communication history data as a result of communication through the communication unit such as the line controlling unit 25 and the modem 27 is written into the log file which is the history data file and very versatile and compatible with the personal computer 50, and the log file is written into the virtual drive area 12d. Therefore, the user can easily confirm the communication history data at the personal computer 50.

Further, image data is written into the virtual drive area 12d from various sources. In such a case, concurrent writing of the image data from various sources must be prohibited, unless the data processing is constructed to recognize the source of the image data written into the virtual drive area 12d.

If sorting arrangement is provided in the memory unit, concurrent writing of the image data into the virtual drive area 12d not only from the writing unit but also from the terminal device 50 can be performed. Therefore, convenience of the digital multifunction device 1 can be enhanced.

In the present embodiment, folder structures are provided in the virtual drive area 12d, so that the kind of data in the virtual drive area 12d can be acknowledged, whereupon various process operations such as facsimile transmission through the virtual drive area 12d can be performed at the digital multifunction device 1.

Further, in the digital multifunction device 1, image data for facsimile transmission can be acquired from the personal computer 50 through the virtual drive area 12d, and the image data can be transmitted to the destination specified by the user. Thus, convenient handling can result.

In addition, generally, facsimile transmission at midnight is very annoying for the opponent. In the present embodiment however, such problem can be avoided since transmission time can be instructed at random to the digital multifunction device 1 through the transmission specification file.

Further, in the multifunction device 1, because the RAM 12 is a volatile memory, image data storage cannot be maintained when the multifunction device 1 is turned off. However the personal computer 50 connected to the multifunction device can store the image data in the RAM 12 into the hard disk 54 in order to avoid loss of the image data stored in the RAM 12.

Further, since the personal computer 50 is equipped with with the data deleting function (S740), for deleting the image data stored in the virtual drive area 12d after duplication, it is possible to avoid a situation where new image data cannot be any more written into the virtual drive area due to successive storage of the image data thereinto.

Incidentally, the programs for implementing the various processes executed by the CPU 10 and the CPU 51 can be supplied to the user on a recording medium such as a CD-ROM or

flexible disk.

While the invention has been described in detail and with reference to specific embodiment thereof, it would be apparent to those skilled in the art that various changes and modifications may be made therein without departing from the scope of the invention.

For example, in the preferred embodiment, the personal computer 50 and the digital multifunction device 1 are connected using the USB interface 37, and the personal computer 50 is enabled to recognize the virtual drive area 12d as an external storage device based on the USB standard. However, an interface according to the IEEE 1394 standard or another interface may be used in place of the USB interface 37. However, such interfaces should preferably support Plug and Play.

Further, a dialog box can be displayed on the display 55 in the terminal-end fax transmitting process that prompts the user to select an image quality mode for the facsimile data (standard, fine, or superfine). Image quality selection data for the image quality mode acquired from the input device may be embedded in the transmission specification file.

In addition, in the mail transmitting process shown in Fig. 13, concurrently with the second facsimile transmitting process, communication history data indicating destination of e-mail, transmitting date, transmitting time, and a name of transmitted data can be generated after e-mail transmission,

and the generated communication history data can be written into the log file.